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July 14, 2017

By Electronic Mail and First Class Mail

Ms. Sheri L. Bianchin
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Institutional Controls Coordinator
U.S. Environmental Protection Agency Region 5
77 West Jackson Boulevard (SR-6J)
Chicago, IL 60604

Re: NL Industries/Taracorp Superfund Site; Granite City, Illinois
Remedial Action Report

Dear Ms. Bianchin:

On behalf of the NL Industries/Taracorp Superfund Site Group (Group), enclosed are three CDs, each containing a copy of the Remedial Action Report, prepared by the Group's contractor, Environmental Works, Inc., which document the completion of remedial activities performed at the NL Industries/Taracorp Superfund Site from 2015 to 2017.

Very truly yours,

LEED ENVIRONMENTAL, INC.

Jeffrey A. Leed
Project Coordinator

enclosures

cc: Ms. Erin Rednour - Illinois EPA
(with attachment by electronic mail and CD by first class mail)
Mr. Tom Miller – Illinois EPA
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Mr. Dan Zahner – Environmental Works, Inc.
(with attachment by electronic mail and CD by first class mail)
Technical Committee, NL Industries/Taracorp Superfund Site Group
(with attachment electronic mail and CD by first class mail)

ENVIRONMENTAL WORKS
OUR EXPERTISE. YOUR SUCCESS.

REMEDIAL ACTION REPORT

NL INDUSTRIES/
TARACORP SUPERFUND SITE
GRANITE CITY, ILLINOIS

July 2017

Prepared For:
NL INDUSTRIES/TARACORP SUPERFUND SITE GROUP

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1. Introduction

Environmental Works, Inc. (EWI) prepared this report on behalf of the NL Industries/Taracorp Superfund Site Group (Group) to document the remedial activities completed from 2015 to 2017 at the NL Industries/Taracorp Superfund Site (Site) in Granite City, Illinois.

The Site encompasses the main industrial site (Figure 1), located at 1555 State Street in Granite City, Illinois, and immediately adjacent areas, where secondary lead smelting and lead-acid battery recycling activities were previously performed, and the surrounding areas shown on Figure 2, which include residential properties in Granite City, Madison, and Venice, Illinois.

The remedial activities addressed in this report were conducted by EWI in two mobilizations. The first mobilization was conducted from August to December 2015, and the second mobilization was conducted from October to December 2016. Final inspections, confirming the completion of remedial activities, were performed for the first mobilization in June 2016 and for the second mobilization in May 2017.

1.1. Site Description and Background

The main industrial site (Figure 1) is located in a heavily industrialized section of Granite City, Illinois, approximately two miles east of St. Louis, Missouri. As shown on Figure 2, the impacted areas of the Site also include certain residential properties within the cities of Granite City, Madison, and Venice, Illinois. Secondary lead reclamation operations and lead-acid battery recycling operations were conducted at the main industrial site from 1903 until 1983.

In May 1985, a former owner and operator of the main industrial site, NL Industries, voluntarily entered into an Agreement and Administrative Order by Consent with the Environmental Protection Agency (EPA) and the Illinois Environmental Protection Agency (Illinois EPA) to perform a remedial investigation and feasibility study (RI/FS) of the Site. The Site was added to the National Priorities List (NPL) in 1986.

To facilitate and prioritize remedial activities, EPA divided the Site into three areas of concern:

Main Industrial Site: 10 properties that formerly included the lead acid battery recycling and secondary lead smelting facility, the waste pile recycling operation, and a trucking company.

Remote Fill Areas: The remote fill areas of the Site included properties in Eagle Park Acres, most of the alleys in Venice, Slough Road in Venice, and several other locations in and around Granite City where hard rubber battery case materials containing lead were used to fill low-lying areas.

Adjacent Residential Areas: The residential areas of the Site are adjacent to the main industrial site and include approximately 500 acres within the cities of Granite City, Venice, and Madison, Illinois.

From 1993 through 2001, EPA and the Group performed remedial actions at the main industrial site, for more than 1,600 residential properties, and for more than 20 alleys and other remote fill areas.

In 2006, EPA requested the Group's assistance in implementing institutional controls for the Site which among other items included: seeking access from the owners of 84 residential properties where EPA and the Group were previously unable to obtain access, from the owners of 9 supplemental environmental project (SEP) properties; and from the owners of 2 additional residential properties where the owners requested soil sampling; performing soil sampling for the 95 properties (if access was obtained); and performing soil remediation for those properties where the lead concentrations in soil exceeded 500 mg/kg.

Of the 95 properties, 3 properties were dropped from the Group's efforts because they were industrial or commercial properties, or the address did not exist. For properties where the Group and EPA received access from the owners, the Group performed soil sampling during several events from 2011 to 2016 in accordance with the procedures previously approved by EPA. The results of the Group's soil sampling activities were addressed in the following reports which have been submitted to EPA:

- Soil Sampling and Analysis Report, prepared by EWI and submitted to EPA on January 6, 2014
- Soil Sampling and Analysis Report Addendum, prepared by EWI and submitted to EPA on December 15, 2015
- Soil Sampling and Analysis Report Addendum No. 2, prepared by EWI and submitted to EPA on September 22, 2016

Based on the results of soil sampling on the residential properties where access was obtained, soil remediation was determined to be required as follows:

Table 1
Summary of Residential Property Sampling Outcome

No Further Action (lead concentrations in soil were below 500 mg/kg)	28 Properties
Drip Zone Remediation Only (only drip zone soil was above 500 mg/kg)	16 Properties
Yard Remediation Required	34 Properties (38 Addresses)

For properties where drip zone only remediation was required, the Group mailed notifications to the property owners to contact the Madison County Community Development for participation in the supplemental environmental project.

As indicated on Table 1, the Group and EWI determined in consultation with EPA that soil remediation was required in residential yards at 34 residential properties (38 addresses); drip zone remediation was also required for some of those properties. The properties were segregated by size. Front yard, side yard(s), back yards, drip zones, bare play areas, and vegetable gardens were segregated at properties with a surface area of less than 6,500 square feet (sf^2). The properties and the excavation details for those properties are included on Table 2.

Table 2
Excavation Details – Yard, Drip Zone, and Bare Play Area/Vegetable Garden Properties

Denied Access Property Number	Address	Front Yard			Back Yard			Side Yard			Drip Zone			Bare play area/vegetable garden			Total Yards³ (nearest yd³)
		Area (ft^2)	Depth (in.)	yds^3	Area (ft^2)	Depth (in.)	yds^3	Area (ft^2)	Depth (in.)	yds^3	Area (ft^2)	Depth (in.)	yds^3	Area (ft^2)	Depth (in.)	yds^3	
DA 7	non-	500	3	**4.6**							130	6	**2.4**				**7**
DA 15	non-	340	6	**6.3**				405	6	**7.5**	108	12	**4.0**				**18**
DA 14	non-	650	3	**6.0**	1900	3	**17.6**				160	12	**5.9**				**30**
DA 16	non-	630	6	**11.7**	2100	12	**77.8**				295	12	**10.9**				**100**
DA 23	non-	400	3	**3.7**							325	3	**3.0**				**7**
DA 24	non-				1250	12	**46.3**				275	6	**5.1**				**51**
DA 34	non-							375	12	**13.9**	195	3	**1.8**				**16**
DA 36	non-				1875	12	**69.4**				45	3	**0.4**				**70**
DA 37	non- non-	405	6	**7.5**													**8**
DA 39	non-													65	6	**1.2**	**1**
DA 44	non-				705	12	**26.1**				190	3	**1.8**				**28**
DA 55	non-													375	12	**13.9**	**14**
DA 58	non-													315	12	**11.7**	**12**
DA 65	non-	240	6	**4.4**	1500	12	**55.6**				80	6	**1.5**				**61**
DA 74	non-	650	6	**12.0**							110	6	**2.0**				**14**
DA 75	non-	700	3	**6.5**	2500	3		300	3	**2.8**							**9**
DA 77	non-	600	3	**5.6**							175	6	**3.2**	35	3	**0.3**	**9**
DA 78	non-							230	3	**2.1**	250	12	**9.3**				**11**
SEPP 15	non-							220	6	**4.1**	290	6	**5.4**				**9**
SEP 52	non- respons iv							345	6	**6.4**	300	12	**11.1**				**18**
DA 17	non-	652	12	**24.15**	2804	12	**103.9**	440	12	**16.3**	243	12	**9**				**153**

Subtotal for excavation **646**

Properties with surface areas greater than 6,500 ft² were divided into four quadrants and drip zones. The properties and the excavation details for those properties are included on Table 3.

Table 3
Excavation Details – Quadrant Properties

Property Type/ Number	Address	Quadrant 1			Quadrant 2			Quadrant 3			Quadrant 4			Drip Zone			Total yds^3 (nearest yd^3)
		Area (ft^2)	Depth (in.)	yds^3	Area (ft^2)	Depth (in.)	yds^3	Area (ft^2)	Depth (in.)	yds^3	Area (ft^2)	Depth (in.)	yds^3	Area (ft^2)	Depth (in.)	yds^3	
DA 9	non- IL							810	12	**30.0**				300	12	**11.1**	**41**
DA 10	non- IL										1675	12	**62.0**				**62**
DA 13	non-	1190	12	**44.1**	1190	12	**44.1**	1190	12	**44.1**	1190	6	**22.0**				**154**
DA 18	non-	691.2	3	**6.4**	572.4	3	**5.3**							140.4	3	**1.3**	**13**
DA 28	non- IL							420	12	**15.6**							**16**
DA 30	non-							1550	12	**37.4**				385	3	**3.6**	**41**
DA 43	non- r. Madison, IL							2070	12	**76.7**	2390	12	**88.5**				**165**
DA 46/47	non- responsiv	465	12	**17.2**							1395	6	**25.8**	55	6	**1.0**	**44**
DA 51	non-	780	12	**28.9**													**29**
DA 60	non-										1550	3	**14.4**				**14**
DA 70	non-	200	6	**3.7**				1375	6	**25.5**				62.5	12	**2.3**	**31**
DA 79/80	non- responsi	1200	6	**22.2**				950	12	**35.2**							**57**
DA 84	non- responsiv	750	6	**13.9**	1600	12	**59.3**	2150	12	**79.6**				372	12	**13.8**	**167**
													Subtotal for excavation				**835**

A total of 1,481 cubic yards of impacted soil was planned for removal from the 34 properties (38 addresses) listed on Table 2 and Table 3. As indicated in further detail in Section 2.5, the Group and EWI were unable to obtain access for remediation from the owners of several properties where soil sampling had previously been performed.

1.2. Remedial Action Work Plan

The Group prepared an Updated Remedial Action Work Plan for Residential Soil Remediation and 1555 State Street Property Sidewalk Replacement (RAWP) to define remediation procedures to be performed by the Group to address the portions of the residential properties at the Site where the lead concentrations in soil exceeded 500 mg/kg. The RAWP also defined the procedures to be used by the Group for remediation of the sidewalk, including lead-impacted soil and hard rubber battery case chips, along the 1555 State Street property. The RAWP was submitted to the EPA in June 2015 and, after receiving comments from the EPA, a revised version of the RAWP was submitted to EPA and approved in August 2015. The Group selected EWI as its contractor to complete the remedial actions outlined in the RAWP.

2. Remedial Activities

This section outlines the remedial activities performed at the Site to address the impacted soil on residential properties and the lead impacted soil and exposed battery case chips along the sidewalk on the 1555 State Street property.

2.1. Pre-Mobilization Activities

2.1.1. Project Plans

Prior to mobilizing to the Site, the following project plans were prepared by EWI and submitted to EPA for approval.

Health and Safety/Contingency Plan (HASCP): The HASCP detailed site-specific health and safety protocols and procedures to be followed during the remedial activities. All EWI field team members reviewed the HASCP prior to performing work at the Site.

Transportation Plan: The Transportation plan provided directions to Milam Landfill for the disposal of excavated soil, and protocols for equipment movement between residential properties and the main industrial site.

Sampling and Analysis Plan (SAP) Addendum: The SAP Addendum summarized changes to the Sampling and Analysis Plan previously prepared by ENTACT for remedial activities completed at the Site from 1998 to 2001. The SAP Addendum outlined sampling requirements, methods, sample identification/labeling protocols, and laboratory analyses to be employed during the remediation activities.

Quality Assurance Project Plan (QAPP) Addendum: The QAPP Addendum summarized changes to the QAPP previously prepared by ENTACT. The QAPP Addendum described the roles and responsibilities for EWI personnel for the remediation activities. The QAPP also summarized data quality objectives and quality assurance methods for the remediation activities.

2.1.2. Residential Property Access

The Group obtained access agreements between 2011 and 2015 from residential property owners for remediation of lead-impacted soil. Copies of the signed access agreements are included in Appendix A. Prior to mobilizing the remediation crews to the Site, the Group sent a notification letter via certified mail to each property owner regarding the upcoming work.

2.2. Mobilization and Site Preparation

2.2.1. Notifications and Pre-Remediation Property Documentation

Prior to mobilizing the remediation crews to the Site, the mayors of Granite City, Madison, and Venice were notified regarding the scope of the remedial activities and schedule for work. Likewise, the railroad adjacent to the 1555 State Street property (Terminal Railroad Association of St. Louis (TRRA)), the police departments of Granite City, Madison, and Venice, Illinois, and other emergency responders were notified of the upcoming work.

Each property owner(s) was notified that soil remediation activities would be performed, an approximate schedule for activities, and to arrange meetings. After residents were contacted, EWI personnel met with each property owner to explain the process and to document the pre-remediation conditions on each property. Each property was documented by a property inspection form, photographs, and a video. Pre-remediation conditions (house, foundation, sidewalks, driveways, entrance roadways, curbs, patios, decks, fences, landscaping, etc.) were all documented during the initial site walk with the property owner. In some cases, the owners declined the meeting, but gave EWI permission to proceed with the work without their presence. All property owners were contacted regarding the remediation with the exception of the owner of the property at 1427 Madison Avenue, Madison. Two other owners denied access to their properties for remediation. Additional information about those properties is included in Section 2.5.

2.2.2. Utility Locating

EWI contacted the Illinois one-call service, Joint Utility Locating Information for Excavators, Inc. (JULIE), prior to field activities to allow member utilities sufficient time to mark utilities on the residential properties and on the 1555 State Street property where remedial activities were planned to be performed. All public utilities were located on each property prior to soil excavation. Additionally, all property owners were asked to identify private utilities on their property; the locations of the utilities were documented on property drawings.

2.2.3. Site Preparation

A mobile office and restroom facilities were set up at the 1555 State Street property to be utilized during the remedial activities. The mobile office was used as a meeting location and equipment staging area. Residential properties were prepared for excavation by delineating the excavation zones, removing or relocating objects that could interfere with the excavations, and using barricades, caution tape, and orange snow fencing, as necessary, to control unauthorized access into work areas.

2.2.4. Disposal Characterization and Backfill Sampling

Representative soil samples from residential properties and the sidewalk area adjacent to the 1555 State Street property were collected for disposal profiling purposes. One soil sample was collected for each 200 cubic yards of soil that were planned to be excavated. Five soil samples were collected in 2015 for the remedial activities conducted in 2015, and four additional soil samples were collected for the remedial activities conducted during 2016. Each sample was packaged, and transported under chain of custody to Pace Analytical Services, LLC (Pace) for analysis. Each sample was analyzed for total lead and toxicity characteristic leaching procedure (TCLP) lead. The total lead concentrations in the soil to be excavated ranged from 232 mg/kg lead to 3,070 mg/kg lead. The TCLP lead results were all below the

laboratory detection limits of 0.50 ppm. The analytical data were submitted to Waste Management in East Saint Louis (Milam Landfill) where the soil to be excavated from the residential properties was profiled as non-hazardous, special waste for disposal. The laboratory analytical reports are provided in Appendix B.

The topsoil (known as Topsoil Plus) which was planned for backfilling excavated areas on residential properties was obtained from St. Louis Composting, Inc. in Belleville, Illinois. Composite samples of Topsoil Plus were collected for each 1,000 cubic yards of soil backfill to be installed. Two samples were collected in 2015 and one sample was collected in 2016. Backfill samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, herbicides, RCRA 8 metals, pH, and total organic carbon. EPA and Illinois EPA reviewed the analytical data, provided in Appendix B and summarized on Table B-1, and determined that the Topsoil Plus was acceptable for use as backfill.

2.2.5. Mobilization

EWI mobilized the remediation crews and equipment to Granite City on September 28, 2015 for the first mobilization, and on October 17, 2016 for the second mobilization.

2.3. Residential Soil Remediation

Remediation of the residential properties was accomplished by removing lead impacted soil with total lead concentrations above 500 mg/kg (photographs of the remedial actions are included in Appendix C). Figure 3 shows the location of each residential property that was remediated. The areas to be remediated and the excavation depths for each property (summarized on Table 3 and Table 4) were pre-determined during the soil sampling phase of the project based on the results of soil characterization sampling. The characterization methods and results are outlined in the RAWP, but in general consisted of collecting a five point aliquot from the front, back, and side yards of properties less than 6500 ft^2 in area, and sampling 4 quadrants for properties greater than 6500 ft^2 in area. The soil aliquots for each area were combined into a composite sample at discrete depths (0-3 inches, 3-6 inches, and 6-12 inches below ground surface (bgs)); drawings depicting the areas and depths of excavation are included in Appendix D. Vegetable gardens, drip zones, and play areas were also sampled in the same manner. Soil excavation was conducted for each area where the total lead concentrations in soil exceeded 500 mg/kg, to the depth that exceeded 500 mg/kg, with a maximum excavation depth of 12 inches.

2.3.1. Impacted Soil Excavation Methods and Schedule

The residential soil excavation was completed in two mobilizations. The first mobilization began on September 30, 2015 and continued through November 5, 2015. During that time period, the sidewalk remediation was also completed along the 1555 State Street property. A total of 14 residential properties (17 addresses) were remediated during the first mobilization. The second mobilization occurred between October 18, 2016 and November 11, 2016. A total of 17 properties (18 addresses) were remediated during the second mobilization. A complete chronology of remediation activities is included in Section 3 (Table 5 and Table 6). As a result of the remedial actions, a total of 1,007 cubic yards (yd^3) of lead impacted soil was removed from the 31 residential properties and disposed off-site.

The excavation area(s) were delineated and marked out on each property using paint. Impacted soil removal was accomplished by manual and mechanical excavation. Manual excavation consisted of using shovels to remove soil that was adjacent to structures, landscaping, root structures of trees, or other items that may have been damaged by the use of equipment. Mechanical excavation was conducted using mini excavators and/or a compact track loader. This equipment was used to excavate soil from large areas free of structures and to load excavated soil into dump trucks. Whenever visible dust was generated during excavation, water was sprayed onto the excavation area to ensure that dust that may contain lead was not mobilized off-site. The excavation depths on each property were confirmed by taking measurements to ensure that the excavation was completed as planned.

2.3.2. Transportation and Disposal

Excavated soil was loaded into dump trucks and transported to Milam Landfill for disposal. Dump truck routes adhered to the Transportation Plan which was designed to cause minimal disruption to the surrounding neighborhoods. During transportation, each load of soil was covered with a tarp to prevent soil from spilling onto the roadway and to minimize dust. Approximately 1,471.09 tons of excavated soil from the residential properties were disposed at the Milam Landfill as special waste. Landfill tickets are included in Appendix C.

2.3.3. Air Monitoring and Sampling

EWI performed air monitoring and sampling during excavation activities to ensure that potentially lead containing dust was not being mobilized from the properties. TSI DustTrak™ II Aerosol Monitors Model 8530 (DustTrak™) were utilized to monitor the concentration of airborne dust. Each DustTrak™ measured airborne particulates 10 micrometers or less in diameter (PM10) at breathing zone height (approximately four feet above the ground surface) in micrograms per cubic meter (µg/m³).

One DustTrak™ was positioned on the upwind side of the excavation, and another was positioned on the downwind side of the excavation. EWI collected real time measurements from the DustTracks™ in 30 minute intervals. The downwind data were compared to the upwind data to determine the concentration of airborne particulates, if any, that were being added from the remedial activities. The action level for dust added by remedial activities was set at 100 µg/m³ above background, as outlined in the RAWP. The background level was determined by the upwind monitor. The action level was not exceeded during the remedial work.

In addition to air monitoring, personal and area air samples were collected to determine the concentration of lead in the airborne dust. Air samples were collected from personal air samplers to determine potential worker respiratory exposure, and from air samplers co-located with the DustTrak™ units. Each sample was analyzed for total lead. All lead in air sample results were below the laboratory reporting limits of 0.69 µg/m^3 to 1.4 µg/m³. The concentrations were calculated based on the flow rate of the samplers and the duration of the sample. In general, the flow rates were set between three and four liters per minute, and the duration was between eight and 10 hours. The permissible exposure level (PEL) for lead in air, as defined by the Occupational Safety and Health Administration (OSHA) in 29 CFR 1926.62 for worker protection, is 50 µg/m³ over an eight hour day. Since the highest concentration of lead in air was less than 1.4 µg/m³, the respirable amount of lead in air was significantly lower than the PEL. Laboratory reports are included in Appendix B.

2.3.4. Decontamination

Equipment was decontaminated after remedial activities were completed at each residential property. Decontamination was achieved by using shovels and brooms to remove potentially impacted soil from the equipment. The removed soil was collected on plastic sheeting and taken to Milam Landfill for disposal. Sidewalks and streets adjacent to areas where impacted soil was handled were also cleaned to remove any potentially impacted soil.

Decontamination stations were used for personnel decontamination. A decontamination station was set up at each property and included a boot wash, and potable water for hand and face washing. All water used for decontamination was collected, reclaimed, and used for dust suppression.

2.3.5. Residential Property Restoration

EWI subcontracted Pollock Landscaping to restore the residential properties after excavation activities were completed. Excavated areas were restored by using preapproved topsoil (Topsoil Plus) to backfill the excavation to the original grade. Topsoil Plus is a 70%/30% mixture of topsoil and compost designed for use as a sod base and restoring depleted garden beds, and was free of trash and other deleterious debris.

Pollock Landscaping backfilled the excavated areas to a uniform and smooth surface, which was the same as the pre-excavation grade. The fill was lightly compacted to eliminate settling and ensure a smooth finish. Fescue sod was installed in all disturbed areas with no open joints or overlapping. Sod was installed in all disturbed areas, so that there were no bare areas on the properties. Pollock Landscaping maintained the sod for 30 days after installation by watering as necessary and as outlined in the RAWP.

Trees, shrubs, and other vegetation, which the home owner wanted to retain, were removed prior to excavation and were replaced after the installation of the sod. Likewise, any fences or gates that were temporarily removed to provide access to the property were replaced.

2.3.6. HEPA Vacuuming

Upon completion of remedial activities at each residential property, EWI offered to perform HEPA vacuuming activities within the interior of the residential dwelling, or to loan a HEPA vacuum to the owner for his use. Despite encouraging home owners to participate, many owners denied EWI access to the interior of the residential dwelling and the loan of the HEPA vacuum. Two property owners (1935 Benton St. and 1217 Iowa St.) allowed access into their homes for vacuuming.

HEPA vacuums were used during the vacuuming process. EWI crew members wore dust masks while vacuuming, and clothing that covered all exposed skin. Home owners walked through the residence with the crew members to identify which areas of the house EWI could access and vacuum. During the vacuuming process, EWI vacuumed floors, walls, window and door sills, and furniture. All vacuuming methods were performed in accordance with Appendix 7 of the RAWP titled “U.S. Department of Housing and Urban Development Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing, July 2012”.

2.3.7. Post-Remediation Property Documentation

Upon completion of restoration activities, EWI conducted meetings with property owners to ensure they were satisfied with the restoration of their properties and to answer any questions. Post-remediation photographs were taken to document the property conditions, and to resolve any issues. Owners were asked to sign the Post-Remediation Agreement/Inspection Form to document that the owner was satisfied with the restoration of the property. Only one signature was not obtained. The owner of 2263 State Street property in Granite City thought that it would be inappropriate for him to sign the form since the property was going through foreclosure. Copies of the signed Post-Remediation Agreement/Inspection Forms are included in Appendix D.

2.4. Sidewalk Remediation

The sidewalk remediation along the 1555 State Street property in Granite City involved the removal of the deteriorated sidewalk, and excavation of the subbase, visible battery case chips, and impacted soil containing total lead concentrations greater than 1,000 mg/kg, with a maximum excavation depth of 3 feet bgs. Removal began on October 22, 2015, and continued through November 4, 2015. Work within 25 feet of the railroad, on the northeast end of the sidewalk, was coordinated with TRRA.

2.4.1. Utilities

A high pressure gas main was located under the sidewalk, and along the entire length of the sidewalk. In order to safely excavate the area, EWI manually dug pot holes on top of the gas main every 10 linear feet to confirm the depth of the main. The gas main was found to be present approximately five to six feet bgs. After the depth of the gas main was determined, mechanical excavation was used to remove the remaining material.

2.4.2. Sidewalk Excavation

For the excavation work, the sidewalk area was split into 11 grids labeled A (on the northeast end) through K (on the south west end), as shown on Figure 4. Each grid was approximately 50 feet long and approximately 9 feet wide (distance from the street to the fence), with the exception of Grid K which was approximately 65 feet in length. After the sidewalk was removed and the gas main located, the excavation was completed with a mini excavator. The initial excavation was 18 inches bgs, which removed the sidewalk subbase and most of the visible battery case chips. After inspection, an additional six inches were removed from Grid A and Grid F to remove battery case chips that were still present. Thus, the total excavation in Grid A and Grid F was 24 inches bgs.

2.4.3. Transportation and Disposal

As a result of the excavation activities, a total of 87.13 tons of concrete debris, and excavated soil was loaded into dump trucks and transported to Milam Landfill for disposal as special waste. Landfill tickets are included in Appendix C. As with the residential soil remediation, all transportation was conducted in accordance with the Transportation Plan.

2.4.4. Confirmation Sampling

Confirmation samples were collected from each grid below the sidewalk to confirm that soil with lead concentrations above 1000 mg/kg had been removed. Five evenly spaced aliquot samples were collected from each grid. The aliquots for each grid were collected from the surface of the excavation, composited into a single aliquot, and sent to Pace to be analyzed for total lead. For each day of sampling, duplicate samples were collected at a rate of 10%. Equipment rinsate samples were also collected for each day of sampling. Analytical results for the soil samples from all grids except for Grid I (GS-I-18) were below the remediation objective of 1,000 mg/kg. Six additional inches of soil were excavated from Grid I, bringing the total depth of excavation in that grid to 24 inches bgs, and the grid was resampled (GS-I-24). The confirmation soil sample from Grid I (GS-I-24) had a total lead concentration of 371 mg/kg, which was below the cleanup objective. The analytical results from the confirmation soil samples collected from each grid are summarized on Table 4.

Table 4
Confirmation Sample Results

Grid ID	Sample ID	Total Lead Concentration (mg/kg)
Grid A	GS-A-24	288
Grid B	GS-B-18	204
Grid C	GS-C-18	442
Grid D	GS-D-18	559
Grid E	GS-E-18	180
Grid F	GS-F-24	210
Grid G	GS-G-18	950
Grid H	GS-H-18	777
Grid I (18 inch depth)	GS-I-18	1620
Grid I (24 inch depth)	GS-I-24	371
Grid J	GS-J-18	430
Grid K	GS-K-18	374

As indicated on Table 4, all of the confirmation soil samples met the cleanup objective.

2.4.5. Sidewalk Restoration

After the laboratory results from the soil tests confirmed that the cleanup objective had been achieved, the sidewalk area was restored. The excavation was backfilled in two lifts. The first lift was a base of two inch minus gravel which was installed to approximately 12 inches bgs. The second lift was comprised of three quarters inch minus gravel, which was installed to a depth of eight inches bgs. Buchheit Construction was subcontracted to install a new sidewalk. Buchheit Construction prepared the site for the sidewalk installation which included, setting frames and installing subgrade, and compacting the gravel. The sidewalk was installed at four inches thick along the 565 feet length of the 1555 State Street

property, except for the entrance to the property at the gate along State Street where the sidewalk was installed at eight inches thick. At the railroad crossing, an Americans with Disability Act (ADA)-approved rumble strip was added.

The areas between the street and the sidewalk, and the sidewalk and the fence were filled with the same topsoil used for residential soil restoration to a depth of eight inches bgs. The topsoil was compacted and graded to ensure proper drainage to the street, and sod was installed.

2.5. Deviation from the RAWP

This section describes deviations from the RAWP. All deviations from the RAWP were approved by the Group and EPA prior to implementation.

non-responsive: At the owner's request, remediation of the property was contingent on the removal and replacement of the driveway at the property. The owner also requested that a portion of the back yard of the property be restored with gravel rather than topsoil and sod. The owner's request was granted and the work was performed as requested.

non-responsive: At the owner's request, remediation of the property was contingent on the removal and installation of additional sod in both side yards so that the grass would match the sod installed as part of restoration activities on other areas of the property. The owner's request was granted and the work was performed as requested.

non-responsive: The owner requested that the back yard be restored with gravel instead of topsoil and sod, so that the back yard could be used as a parking area. The owner's request was granted and the work was performed as requested.

non-responsive: The owner denied access for remediation. Multiple attempts were made by EWI, the Group, and EPA to convince the owner to agree to allow remediation but she still declined. Remedial activities were not conducted at non-responsive.

non-responsive: Due to the presence of debris, tree shading, etc. on the property, the property owner requested that no sod be placed in the excavated areas of the back yard. The back yard was restored with topsoil only, as requested by the owner.

non-responsive: The property owner signed an access agreement for sampling and remediation in 2010. Efforts to reach the owner in 2015 and 2016 were unsuccessful. The efforts included sending letters to his non-responsive, Illinois, which were unanswered. Efforts to contact the owner by telephone were also unsuccessful, as the phone number listed now belongs to another individual. EWI attempted to contact the owner at his home residence and it appeared that the house was unoccupied. Although the owner in the Madison County Government's records had not changed, the owner of the neighboring property (non-) had installed a fence around the non- property that extended around the non- property, and also the non- property. The owner of the non- property had also installed a swimming pool on the non- property in the area where the soil remediation was planned to be performed. The owner of the non- property declined to speak with EWI on several occasions, except than indicating that he owned the non- property, and he

did not want anyone on his property. For these reasons, remedial activities were not conducted on the 1007 Grand Avenue property.

non-responsive : Efforts to locate the property owner were unsuccessful. At the time of remediation, the owner of the non-responsive property no longer resided on the neighboring property (non-). The Group and EWI were unable to locate the property owner through communications with neighboring property owners, and the letter that was sent to the property owner on September 28, 2016 was returned with the envelope indicating "unable to forward, return to sender." Because the property owner could not be located, remedial activities were not conducted on the non-responsive property.

3. Chronology of Events

Below is a chronology of remedial actions completed at the site in 2015.

- August 24, 2015 – Began pre-mobilization activities which included a timeframe of approximately four weeks.
- September 28, 2015 – EWI mobilized personnel and equipment to the site.
- September 29, 2015 - Remedial activities at residential properties began. The chronology of residential soil remediation and restoration in 2015 is summarized on Table 5.

Table 5
Chronology of Events – Residential Soil Remedial Activities Completed in 2015

ID	Address	Excavation Date	Backfill Date	Sod Installation Date
DA 60	non-responsive Venice, IL	9/29/2015 - 9/30/2015	10/20/2015	11/3/2015
DA 10	non-responsive. Granite City, IL	Started: 9/29/2015 Completed: 10/1/2015	11/25/2015	11/26/2015
DA 34	non- Madison, IL	10/1/2015	10/15/2015 - 10/16/2015	10/26/2015
DA 37	non- Madison, IL	10/1/2015	10/21/2015	10/27/2015
DA 39	non- Madison, IL	10/2/2015	10/20/2015	11/3/2015
SEP 52	non-responsive. Madison, IL	10/2/2015	10/23/2015	10/27/2015
DA 14	non-responsive. Granite City, IL	10/5/2015 - 10/6/2015	10/20/2015	Started: 10/26/2015 Completed: 11/2/2015
DA 15	non-responsive. Madison, IL	10/6/2015	10/19/2015	10/26/2015
DA 58	non-responsive Venice, IL	10/6/2015	10/15/2015	10/15/2015*
DA 46/47	non-responsive. Madison, IL	10/7/2015	10/21/2015	Started: 10/26/2015 Completed: 11/2/2015
SEP 15	non-responsive	10/7/2015 - 10/8/2015	10/22/2015 - 10/23/2015	10/27/2015
DA 79/80	non-responsive Granite City, IL	10/8/2015	10/22/2015 - 10/23/2015	11/2/2015
DA 55	non-. Granite City, IL	11/2/2015	11/20/2015	11/20/2015*
DA 7	non- Granite City, IL	11/5/2015	11/20/2015	11/23/2015

*Denotes properties where sod was not installed at the home owner's request. The dates provided are the dates that topsoil was installed.

- October 8, 2015 – EWI suspended remedial activities on residential properties which had not already been started at the request of the Group. Properties that were in process of excavation, or had already been excavated, were completed and restored. The properties at non-responsive and non-responsive were excavated and restored in November 2015, at the request of the Group.
- October 21, 2015 – EWI began the removal of the deteriorated sidewalk, subgrade, and impacted soil.
- November 9, 2015 – Excavation of the sidewalk area complete.
- November 11, 2015 – Backfill of the sidewalk area complete.
- November 12, 2015 – EWI remedial action crew demobilized from the site.
- December 16, 2015 – Began pouring concrete for new sidewalk.
- December 21, 2015 – Completed installation of new sidewalk.
- January 12, 2016 – Areas adjacent to the sidewalk restored with sod.

The remaining remedial actions were completed in 2016. Below is a chronology of those actions completed in 2016.

- September 28, 2016 – Began additional pre-mobilization activities. Pre-mobilization activities lasted approximately three weeks.
- October 17, 2016 – EWI mobilized personnel and equipment to the site.
- October 18, 2016 – Remedial activities at residential properties began. The chronology of residential soil remediation and restoration activities in 2016 is summarized on Table 6.

Table 6
Chronology of Events – Residential Soil Remedial Activities Completed in 2016

ID	Address	Excavation Date	Backfill Date	Sod Installation Date
DAP 74	non-responsive Granite City, IL	10/18/2016	10/31/2016	11/4/2016
DAP 30	non-responsive Madison, IL	10/18/2016 - 10/19/2016	11/1/2016	11/16/2016
DAP 24	non-responsive Madison, IL	10/19/2016 – 10/20/2016	11/2/2016 – 11/4/2016	11/16/2016
DAP 44	non-responsive Granite City, IL	10/20/2016 – 10/21/2016	11/7/2016	11/17/2016

Table 6 Chronology of Events – Residential Soil Remedial Activities Completed in 2016				
ID	**Address**	**Excavation Date**	**Backfill Date**	**Sod Installation Date**
DAP 77	non-responsive	10/21/2016	11/2/2016	11/17/2016
DAP 16	non-responsive Granite City, IL	10/24/2016	11/21/2016	12/15/2016
DAP 17	non-responsive Granite City, IL	Started: 10/24/2016 Completed: 11/9/2016	11/10/2016 – 11/11/2016	11/16/2016
DAP 84	non-responsive Madison, IL	10/25/2016	11/8/2016 – 11/9/2016	11/17/2016
DAP 65	non-responsive City, IL	10/26/2016 – 10/27/2016	11/23/2016	12/15/2016
DAP 9	non-responsive City, IL	10/27/2016	12/1/2016	12/15/2016
DAP 70	non-responsive Madison, IL	10/31/2016	12/9/2016	12/14/2016
DAP 18	non- Granite City, IL	11/1/2016	12/8/2016	12/14/2016*
DAP 43	non-responsive Madison, IL	11/1/2016 – 11/2/2016	12/12/2016	12/14/2016
DAP 23	non- Madison, IL	11/2/2016	11/14/2016	11/16/2016
DAP 36	non- Madison, IL	11/3/2016	11/22/2016	12/7/2016*
DAP 78	non- Granite City, IL	11/4/2016	11/21/2016	12/14/2016
DAP 75	non- Granite City, IL	11/11/2016	12/2/2016	12/15/2016

*Denotes properties where sod was not installed at the home owner's request. The dates provided are the dates that backfill or gravel was installed.

- November 12, 2016 – EWI remedial action crew demobilized from the site.

4. Performance Standards and Quality Control

Performance standards and quality control for the remedial project consisted of defined roles and responsibilities, recordkeeping and documentation, inspections, reporting, and quality control analysis.

4.1. Roles and Responsibilities

The roles and responsibilities of the various parties involved in the remedial activities are outlined as follows:

EPA Remedial Project Manager
EPA's project manager had the overall responsibility for the implementation of remedial activities at the site and had the authority to accept and approve all technical activities associated with remedial activities at the Site. The EPA's remedial project manager was Ms. Sheri Bianchin.

Illinois Environmental Protection Agency (Illinois EPA)
The Illinois EPA provided support for EPA on the project. Illinois EPA personnel provided technical and on-site support. The Illinois EPA project participants were Ms. Erin Rednour and Mr. Tom Miller.

NL Industries/Taracorp Superfund Site Group
The NL Industries/Taracorp Superfund Site Group was responsible for the planning, implementation, and successful completion of the remedial action. The Group had the authority to accept or reject the materials and workmanship of the contractors and recommendations from the Group's representatives, including the Group's project coordinator.

Group's Project Coordinator
The Group's project coordinator was responsible for communications (with EPA, Illinois EPA, the Group, the Group's contractor, and the Group's QA officials), for coordination of the work activities with EPA and Illinois EPA, for assisting in resolving issues during the completion of the work, and for keeping the Group informed regarding the project status. The Group's project coordinator was Mr. Jeffrey Leed of Leed Environmental, Inc.

Group's QA Official for Sidewalk Construction
The Group's QA official for sidewalk construction observed the contractor's work during the installation of the sidewalk and ensured that it was installed to the specifications outlined in the RAWP. The Group's QA official for sidewalk construction Mr. Collin Cox of Cox Pavement Consulting, LLC.

Group's Contractor
EWI was selected by the Group as its contractor to perform the remedial activities. EWI was responsible for all remedial activities performed at the Site pursuant to the RAWP.

4.2. Project Documentation

All field remediation activities were documented in a bound, field logbook with consecutively numbered pages, and included the following information.

- Name of the author;
- Data and time of entry;

- Property address / location of activity;
- Names and affiliations of personnel on-Site;
- Sample collection or measurement methods;
- Daily weather report;
- Sample identification information, which was reviewed each day and verified to be correct and consistent with the SAP;
- Remediation depth verified by measurements;
- Field observations and comments;
- Any deviations from the RAWP; and
- Air monitoring

Photographic documentation of field activities is provided in Appendix D.

4.3. Weekly Progress Meetings

Weekly progress meetings were conducted via teleconference to discuss the status of the project, to provide weekly schedule updates, and to resolve issues. The Group's representatives, EPA, Illinois EPA, and EWI participated in the progress meetings. The Group's project coordinator prepared and distributed meeting minutes to the project participants.

4.4. Quality Control Analysis

The SAP and QAPP developed by ENTACT, and the addendums to those documents prepared by EWI, were utilized as guidance for the execution of field sampling activities and laboratory analysis. QA/QC for this work consisted of regulatory compliance, recordkeeping and reporting, analytical sampling, laboratory oversight, and data evaluation. All samples were collected in accordance with the SAP/QAPP and addendums, and all activities were performed in accordance with the RAWP and applicable federal, state, and local regulations and standards. EWI's Quality Control Officer reviewed all analytical and monitoring data generated during the remedial activities to ensure that the data complied with the SAP/QAPP and addendums and the overall data quality to meet Site objectives.

5. Pre-Final and Final Inspections

Pre-final and final inspections were completed at the site for both the residential and sidewalk remedial activities to ensure the work conformed to the RAWP and met the quality standards for workmanship and completeness. Pre-final inspections and final inspections were performed for the work completed in 2015 and 2016.

2015 Pre-Final Inspection

EWI participated in a pre-final inspection at the Site with Erin Rednour and Tom Miller, Illinois EPA, on December 17, 2015. The inspection included an examination of the 16 residential properties and the sidewalk area where EWI completed remedial activities on behalf of the Group in 2015. During the inspection, a punch list containing one work item (construction fence on the non-responsive) that remained to be completed was compiled. During the pre-final inspection, some rolled up construction fence was observed on the non-responsive . The construction fence was removed from the property approximately a week later, after confirming that EWI had left it on-site.

2015 Final Inspection

The final inspection for the 14 residential properties (17 addresses) remediated in 2015 was scheduled for spring 2016 to ensure that the sod had become established after the winter and was still growing well. On June 2, 2016, the Group's project coordinator and EWI's project manager participated in the final inspection with representatives of Illinois EPA. Participants in the June 2, 2016 final inspection were:

- Ms. Erin Rednour – Illinois EPA
- Mr. Tom Miller – Illinois EPA
- Mr. Dan Zahner – EWI
- Mr. Jeff Leed – Project Coordinator for the Group

During the final inspection, the 14 residential properties (17 addresses) that were remediated and restored in 2015 were inspected. The 14 properties are listed as follows:

- non-responsive

No issues were observed during the final inspection. Following the final inspection, a Group's project coordinator distributed a memorandum to document the successful completion of remedial activities.

2016 Pre-Final Inspection

EWI participated in a pre-final inspection at the Site with Tom Miller, Illinois EPA, on December 21, 2016. The inspection included an examination of the 17 residential properties where EWI completed remedial activities on behalf of the Group in 2016. During the inspection, a punch list of the work items that remained to be completed was compiled. During the pre-final inspection, several items were added to the punch list. The items on the punch list and dates they were resolved are listed below.

- non-responsive –A portion of the chain link fence which had been removed to complete remediation and restoration had not been reinstalled. EWI completed the fence reinstallation on December 22, 2016.
- non-responsive – Orange construction fence was left in place blocking off the restored gravel area of the back yard. The construction fence was removed and the original fence was replaced on December 22, 2016.

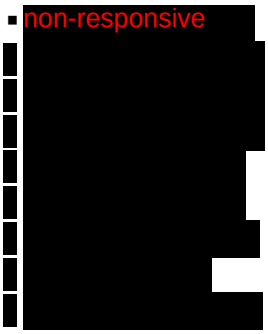
2016 Final Inspection

The final inspection for the 17 residential properties (18 addresses) remediated in 2016 was scheduled for spring 2017 to ensure that the sod had become established after the winter and was still growing well. On May 4, 2017, the Group's project coordinator and EWI's project manager participated in the final inspection with representatives of EPA and Illinois EPA. Participants in the May 4, 2016 final inspection were:

- Ms. Sheri Bianchin - EPA
- Ms. Erin Rednour – Illinois EPA
- Mr. Tom Miller – Illinois EPA
- Mr. Dan Zahner – EWI
- Mr. Jeff Leed – Project Coordinator for the Group

During the final inspection, the 17 residential properties (18 addresses) that were remediated and restored in 2016 were inspected. The 17 properties are listed as follows:

- non-responsive



No issues were observed during the final inspection. Following the final inspection, a Group's project coordinator distributed a memorandum to document the successful completion of remedial activities.

6. Operation and Maintenance

Because the soil remediation on the residential properties achieved the residential soil cleanup objective defined by EPA in the Record of Decision for the Site, no operation and maintenance activities are planned for the remediated residential properties. The sidewalk along the 1555 State Street property, and the restored vegetation along the sidewalk, are inspected and maintained in accordance with the Group's Operation and Maintenance Plan.

7. Contact Information

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Environmental Works Inc. Project Manager
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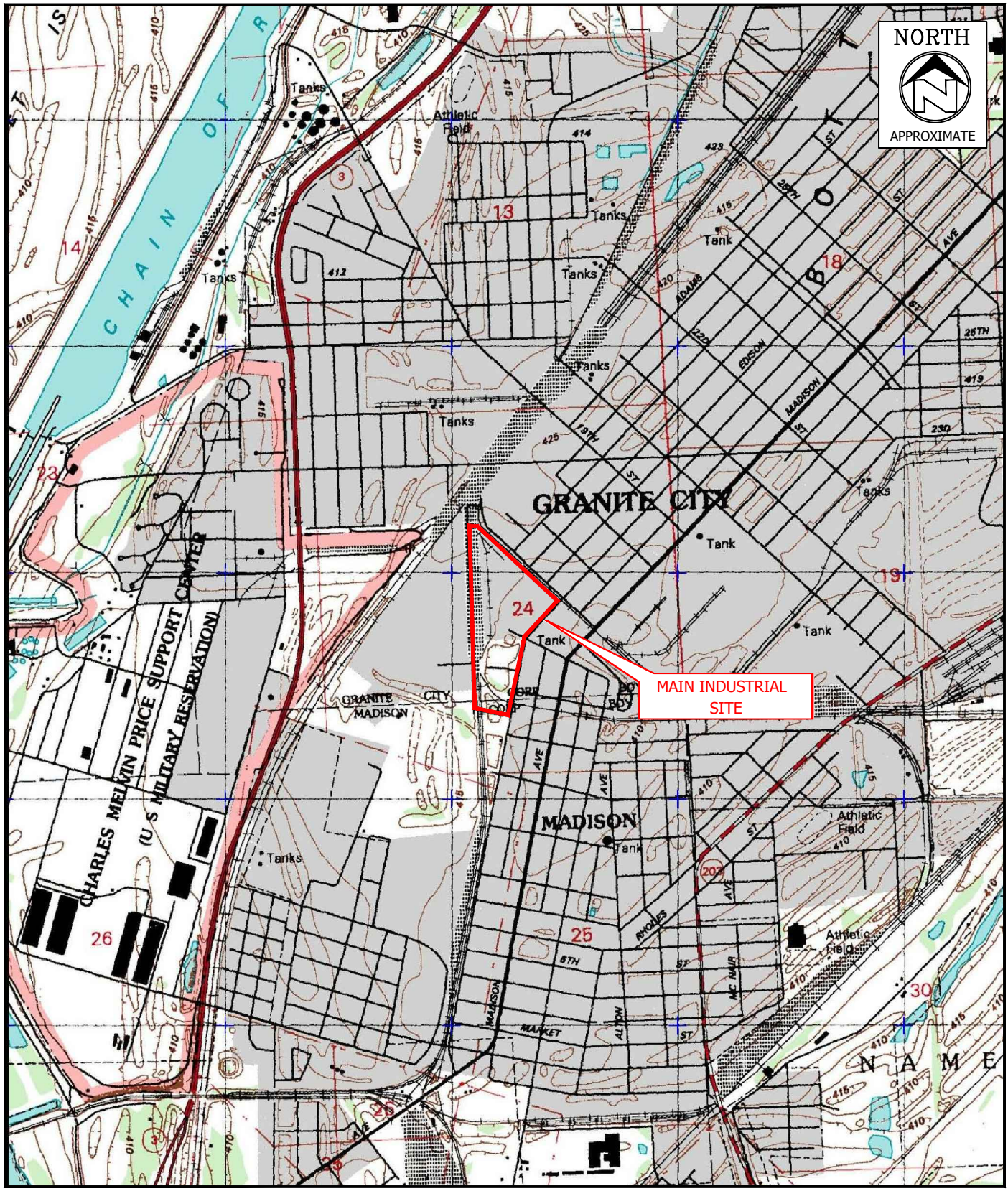
Email:
DZAHNER@ENVIRONMENTALWORKS.COM

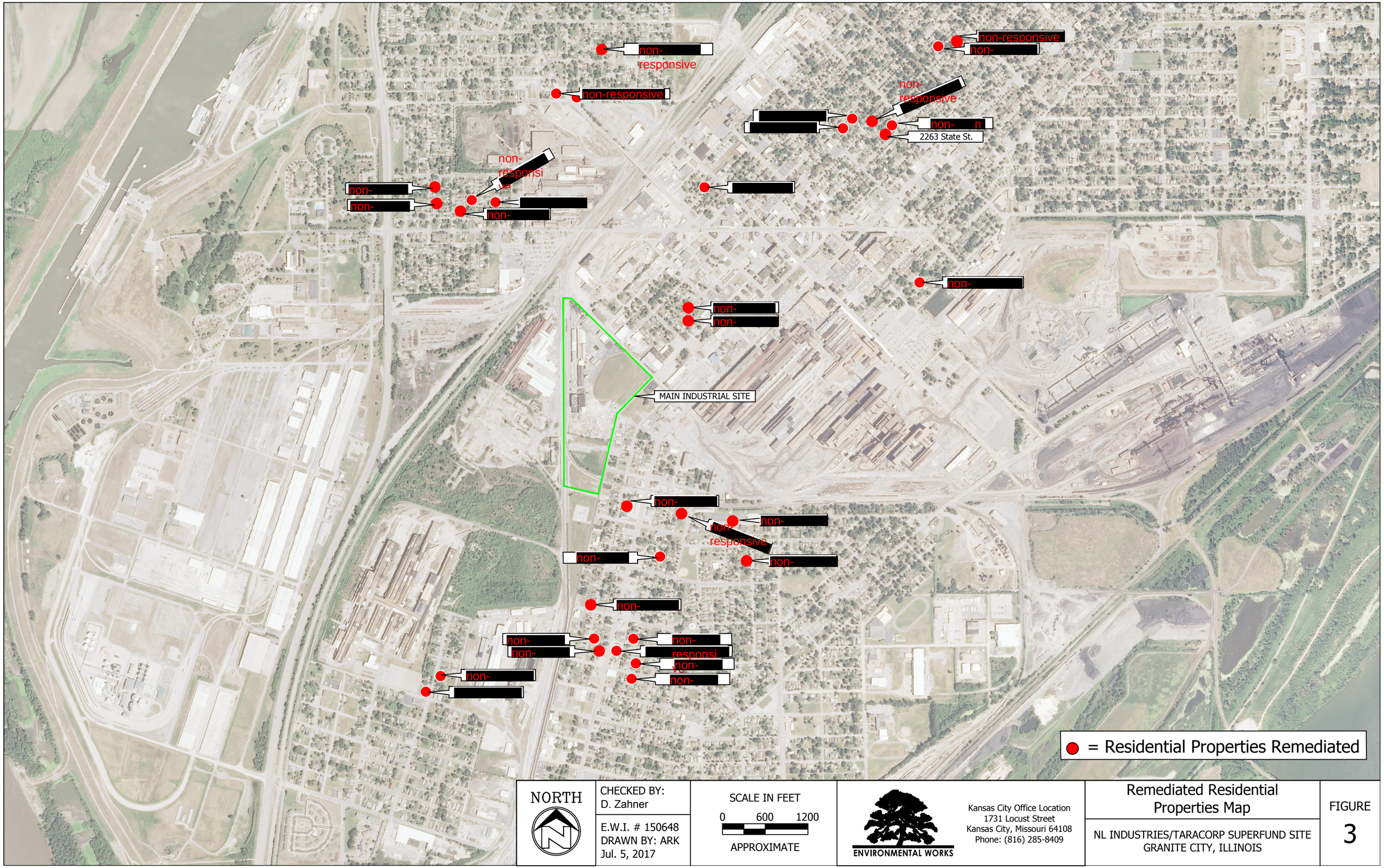
FIGURES



SOURCE: www.mapcard.com (1985)

CHECKED BY: D. Zahner EWI# 150648 DRAWN BY: MEK Dec. 19, 2011	SCALE (FEET) 0 1000 2000 APPROXIMATE	ENVIRONMENTAL WORKS 1731 Locust Street, Kansas City MO 64108	MAIN INDUSTRIAL SITE LOCATION TOPOGRAPHIC MAP NL INDUSTRIES/TARACORP SUPERFUND SITE GRANITE CITY/MADISON, ILLINOIS	FIGURE 1

Figure 2
NL Industries/Taracorp Superfund Site



NORTH

CHECKED BY: D. Zahner

E.W.I. # 150648
DRAWN BY: ARK
Jul. 5, 2017

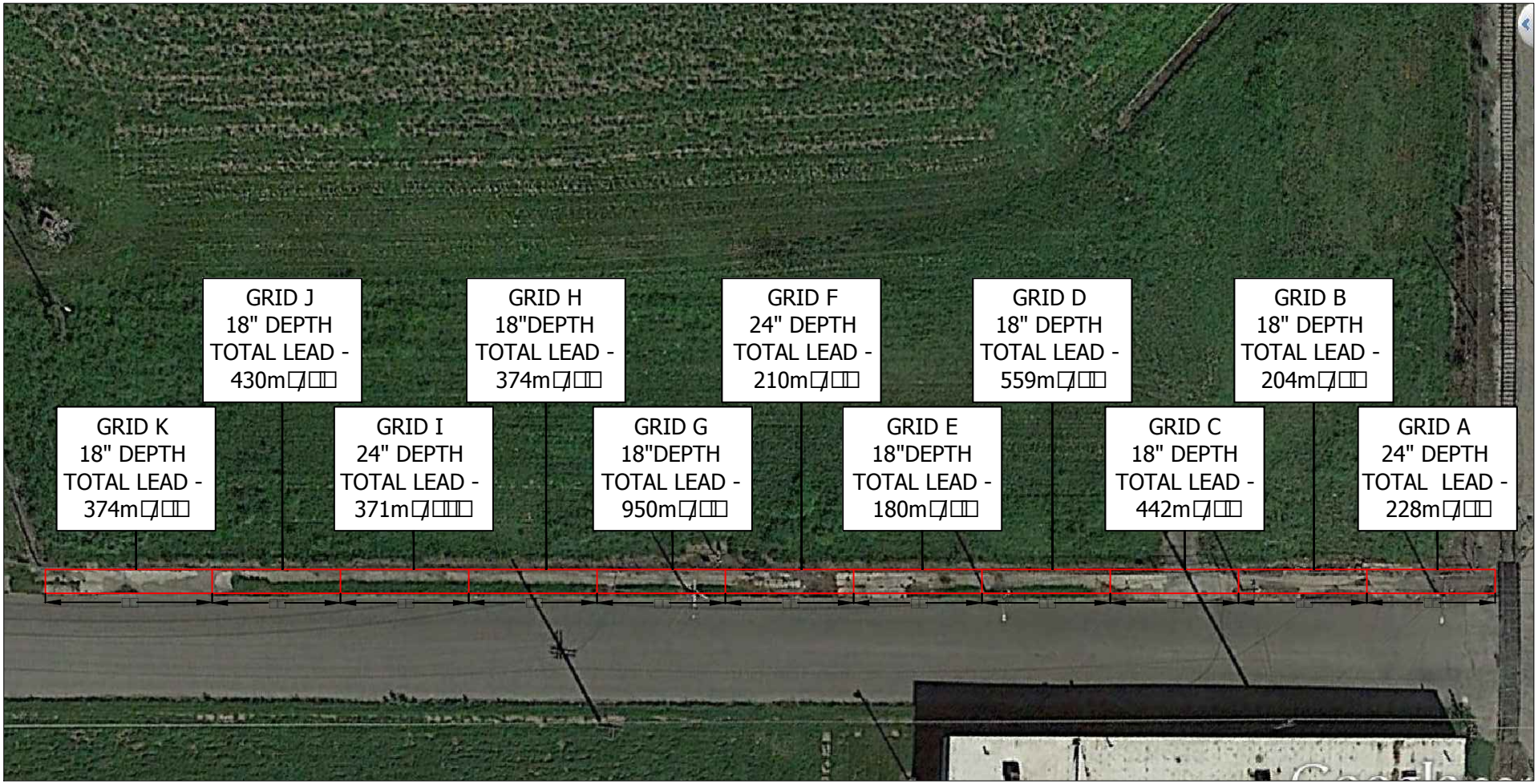
SCALE IN FEET
0 600 1200
APPROXIMATE

ENVIRONMENTAL WORKS
Kansas City Office Location
1731 Locust Street
Kansas City, Missouri 64108
Phone: (816) 285-8409

Remediated Residential Properties Map

NL INDUSTRIES/TARACORP SUPERFUND SITE
GRANITE CITY, ILLINOIS

FIGURE
3



□= SECOND SAMPLING

NORTH	CHECKED BY: D. □ahner E.W.I. # 150648 DRAWN BY: ARK June 7, 2017	SCALE IN FEET 0 30 60 APPROXIMATE	ENVIRONMENTAL WORKS	Kansas City Office Location: 1731 Locust Street Kansas City, MO 64108 Phone: (816) 285-8410	SIDEWALK REMEDIATION MAP 1555 STATE STREET GRANITE CITY, ILLINOIS	FIGURE 4